

Notice of Allowability

Application No.

10/688,834

Examiner

Gary L. Laxton

Applicant(s)

ZHU ET AL.

Art Unit

2838

CM

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the application filed 10/16/03.
2. ☒ The allowed claim(s) is/are 1-44.
3. ☒ The drawings filed on 16 October 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date 3/08/04
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

Gary L. Laxton
Primary Examiner
Art Unit: 2838

6/21/05

DETAILED ACTION

Allowable Subject Matter

1. Claims 1-44 are allowed.

2. The following is an examiner's statement of reasons for allowance:

Claims 1-9; prior art fails to disclose or suggest, inter alia, a power converter comprising a planar transformer coupled to a circuit board, the planar transformer comprising a primary side and a secondary side and having at least a first edge and a second edge opposed to the first edge; a first set of switching devices forming a first full bridge circuit comprising a first, a second, a third and a fourth branch of the first full bridge circuit, at least one switching device in each branch mounted on the circuit board along at least a portion of the first edge of the planar transformer wherein the first and the second branch form a first leg of the first full bridge circuit and the third and the fourth branches form a second leg of the first full bridge circuit, and the switching devices of the first full bridge circuit are linearly arranged and ordered such that the switching devices in the first leg are successively adjacent one another and the switching devices in the second leg are successively adjacent one another; and a second set of switching devices forming a second full bridge circuit comprising a first, a second, a third and a fourth branch of the second full bridge circuit, at least a first switching device in each branch mounted on the circuit board along at least a portion of the second edge of the planar transformer.

Claims 10-19; prior art fails to disclose or suggest, inter alia, a power converter comprising a planar transformer coupled to a circuit board, the planar transformer comprising a

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primary side and a secondary side and having at least a first edge and a second edge opposed to the first edge; and a first full bridge circuit comprising a left half upper branch, a left half lower branch, a right half upper branch and a right half lower branch, the left half upper branch comprising at least a first left half upper branch switching device, the left half lower branch comprising at least a first left half lower branch switching device, the right half upper branch comprising at least a first right half upper branch switching device and the right half lower branch comprising at least a first right half lower branch switching device, each of the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device of the first full bridge circuit are carried by the circuit board in a first primary side line extending parallel to the first edge of the planar transformer.

Claims 20-23; prior art fails to disclose or suggest, inter alia, a method of forming a power converter; comprising: mounting a planar transformer to a circuit board, the planar transformer having a primary, a secondary, and at least a first edge and a second edge; and mounting at least a first left half upper branch switching device, a first left half lower branch switching device, a first right half upper branch switching device and a first right half lower branch switching device on the circuit board in a line extending parallel to the first edge of the planar transformer, the first left half upper branch switching device, the first left half lower branch switching device, the first right half upper branch switching device and the first right half lower branch switching device coupled to form a first full bridge circuit coupled to the primary of the planar transformer.

Claims 24-35; prior art fails to disclose or suggest, inter alia, a power converter comprising a planar transformer carried by a circuit board, the planar transformer comprising a primary side of a number of planar primary windings and a secondary side of a number of planar secondary windings; a first set of switching devices carried by the circuit board; and a first set of heat sink structures carried by the circuit board and located proximate respective ones of the switching devices in the first set of switching devices, at least a number of the heat sink structures thermally conductively coupled to at least one of the number of planar primary windings.

Claims 36-41; prior art fails to disclose or suggest, inter alia, a planar transformer carried by a circuit board, the planar transformer comprising a number of planar primary windings and a number of planar secondary windings; a first set of switching devices carried by the circuit board, the first set of switching devices coupled to the planar primary windings of the planar transformer; a second set of switching devices carried by the circuit board, the second set of switching devices coupled to the planar secondary windings of the planar transformer; and a number of heat sink structures carried by the circuit board and located proximate respective ones of the switching devices in the first and the second sets of switching devices, a first number of the heat sink structures proximate the first set of switching devices thermally conductively coupled to at least one of the number of the planar primary windings and a second number of the heat sink structures proximate the second set of switching devices thermally conductively coupled to at least one of the number of the planar secondary windings.

Claims 42-44; prior art fails to disclose or suggest, inter alia, a method of forming a power converter, the method comprising: mounting a planar transformer to a circuit board, the

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planar transformer having planar primary windings, secondary planar windings, and at least a first edge and a second edge; mounting a first set of switching devices to the circuit board, the first set of switching devices coupled to the planar primary windings of the planar transformer; mounting a second set of switching devices to the circuit board, the second set of switching devices coupled to the planar secondary windings of the planar transformer; mounting a number of heat sink structures to the circuit board proximate a respective ones of the switching devices in the first and the second sets of switching devices, a first number of the heat sink structures proximate the first set of switching devices thermally conductively coupled to at least one of the number of the planar primary windings and a second number of the heat sink structures proximate the second set of switching devices thermally conductively coupled to at least one of the number of the planar secondary windings.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

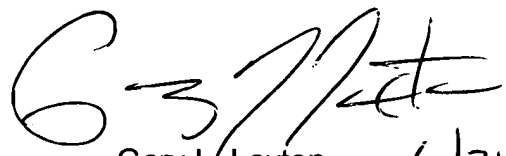
3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 6,862,195 Jitaru discloses a soft transition converter and magnetic packaging structure; US 6,740,968 Matsukura et al disclose heat sinks proximate switching devices; US 6,707,284 Lanni discloses mounting all of the electrical components on a printed circuit board using planar or low profile cores and surface mounted integrated circuits; US 6,515,858 Rodriguez et al disclose heat sinks proximate switching devices; US 6,212,086 Dinh discloses the packaging of a DC to DC converter; US 6,147,583 Rinne et al disclose a transformer assembly on a printed circuit board (figs 2 & 3); US 5,610,449 Takahashi et al disclose a compact thin type electric power unit; US 4,868,732 Gillett et al disclose a planar transformer with plural windings; US 4,803,609 Gillett et al disclose a DC to DC converter with a planar transformer.

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4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary L. Laxton whose telephone number is (571) 272-2079. The examiner can normally be reached on Monday thru Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Sherry can be reached on (571) 272-2084. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Gary L. Laxton
Primary Examiner
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6/21/05